What is claimed is:

1. A multi-layer high temperature superconductor, comprising:
a first high temperature superconductor coated element, comprising:
a first substrate;
at least one first buffer deposited on the first substrate;
at least one first high temperature superconductor layer; and
a first cap layer; and
a second high temperature superconductor coated element, comprising:
a second substrate;
at least one second buffer deposited on the second substrate;
at least one second high temperature superconductor layer; and
a second cap layer;
wherein the first and second high temperature superconductor coated elements are joined at the first and second cap layers.

2. The superconductor of claim 1, wherein the first substrate is biaxially textured.

3. The superconductor of claim 2, wherein the biaxial texturing is by deformation texturing.

4. The superconductor of claim 3, wherein the first substrate comprises nickel.

5. The superconductor of claim 4, wherein the first substrate comprises nickel-chromium, nickel-copper, or nickel-vanadium alloys.

6. The superconductor of claim 5, wherein the first substrate comprises a nickel-chromium alloy.

7. The superconductor of claim 2, wherein the at least one first buffer is epitaxially deposited.

8. The superconductor of claim 1, wherein the at least one first buffer comprises metal oxides.

9. The superconductor of claim 8, wherein the metal oxides comprise cerium oxide and gadolinium oxide.

10. The superconductor of claim 8, wherein the first buffer further comprises yttria stabilized zirconia.

11. The superconductor of claim 1, wherein at least two buffers are sequentially deposited on the first substrate.

12. The superconductor of claim 11, wherein three buffers are sequentially deposited on the first substrate.

13. The superconductor of claim 1, wherein the first high temperature superconductor layer comprises metal oxide.

14. The superconductor of claim 1, wherein the first high temperature superconductor layer comprises rare earth oxides.

15. The superconductor of claim 14, wherein the rare earth oxides have the formula $(RE)Ba_2Cu_3O_{7-\delta}$, wherein RE is selected from the group consisting of rare earth elements and yttrium, and $\delta$ is a number greater than zero and less than one.

16. The superconductor of claim 1, wherein the first cap layer is deposited on the first high temperature superconducting layer.

17. The superconductor of claim 1, wherein the first and second substrates are of substantially identical composition.

18. The superconductor of claim 1, wherein the first and second buffers are of substantially identical composition.

19. The superconductor of claim 1, wherein the first and second high temperature superconducting layers are of substantially identical composition.

20. The superconductor of claim 1, wherein the first and second cap layers are of substantially identical composition.

21. The superconductor of claim 1, wherein the first and second high temperature superconductor coated elements are of substantially identical composition.

22. The superconductor of claim 1, wherein the first and second cap layers are continuously joined at their uppermost surfaces.

23. The superconductor of claim 1, wherein the first and second cap layers are a single continuous layer.

24. The superconductor of claim 1, wherein the superconductor is in the form of a tape.

25. The superconductor of claim 1, wherein the substrates are substantially untextured, and the buffers and high temperature superconductor layers are biaxially textured.

26. The superconductor of claim 24, wherein the first and second high temperature superconductor coated elements are registered at their respective edges.

27. The superconductor of claim 24, wherein the first and second high temperature superconductor coated elements are offset along their lengths.

28. The superconductor of claim 27, wherein at least one of the first and second cap layers extends along the edge of at least the first and second high temperature superconductor coated element.

29. The superconductor of claim 1, wherein the superconductor comprises a multifilamentary structure.

30. The superconductor of claim 29, wherein the first and second high temperature superconducting layers are divided into a plurality of filaments.

31. The superconductor of claim 1, further comprising a stabilizer, wherein the first and second cap layers are joined to opposing surfaces of the stabilizer.

32. A multi-layer high temperature superconductor, comprising:
a first high temperature superconductor coated element, comprising:
a first substrate;
at least one first buffer deposited on the first substrate;
at least one first high temperature superconductor layer; and
a first cap layer; and
a second high temperature superconductor coated element, comprising:
a second substrate;
at least one second buffer deposited on the second substrate;
at least one second high temperature superconductor layer; and
a second cap layer;
wherein the first and second high temperature superconductor coated elements are joined with an intervening metallic layer.

33. A multi-layer high temperature superconductor, comprising:

a first high temperature superconductor coated element, comprising:

a first substrate;

at least one first buffer deposited on the first substrate; and

at least one first high temperature superconductor layer, and

a second high temperature superconductor coated element, comprising:

a second substrate;

at least one second buffer deposited on the second substrate; and

at least one second high temperature superconductor layer;

wherein the first and second high temperature superconductor coated elements are joined with an intervening metallic layer.